

Invasive *Spartina* Control Plan
for
Petaluma River
Sonoma County

Including:

101 to Grey's Field
Grey's Field
Petaluma Marsh
San Antonio Creek to River Mouth

TSN:ISP-2007-24
2007 Control Season

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1. Site Maps and Photographs
2. Work Program
3. Environmental Compliance
4. General Site Safety & Materials Handling Guidelines and Procedures
5. Research (not used)
6. Restoration (not used)

1. Introduction

In 2001, the California State Coastal Conservancy (Conservancy) established the San Francisco Estuary Invasive *Spartina* Project (ISP) to coordinate San Francisco Bay Estuary-wide control of non-native, invasive *Spartina* (cordgrass) species. Regional *Spartina* control efforts prior to the inception of the ISP were scattered, with limited communication between affected landowners. As part of the ISP's Bay-wide approach, a Programmatic Environmental Impact Report/Environmental Impact Statement (PEIR/S) was developed, which was finalized in October of 2003.

This Invasive *Spartina* Control Plan ("Site-Specific Plan" or SSP) for the Petaluma River, Marin County, 'tiers' off of the PEIR/S, and includes background and site information, site-specific goals, treatment strategy, and a description of potential impacts of treatment. The SSP was prepared by consultants of the ISP, in collaboration with the project partners listed below. The SSP also specifies actions or practices ("mitigations") necessary to implement the plan with the least possible adverse environmental impact, in compliance with the ISP's PEIR/S and all applicable regulatory requirements. The SSP will be implemented by the project partners, with assistance from the ISP, beginning in the summer of 2007.

Consistent with the ISP's regional strategy, the SSP was developed based on the concepts of Integrated Vegetation Management (IVM), whereby a broad range of site-specific factors were considered to determine the optimal combination of treatment methods (manual, mechanical, and chemical) and strategies for use at the site. The SSP may be modified over time as new scientific information becomes available, and based on site-specific conditions.

2. Project Partners

Part or all of the work planned at this site will be implemented with grant funding provided by the Conservancy directly to the project partner. The grant recipient for this site is:

Friends of Petaluma River. David Yearsley; executive director, PO Box 4928
Petaluma, Ca. 94955. **Phone:** (707) 763-7756

Friends of the Petaluma River is a non-profit organization dedicated to celebrating and conserving the Petaluma River, its wetlands, and wildlife. Friends' mission is to promote stewardship of the Petaluma River with work throughout its watershed; providing access opportunities, educational materials, and conservation programs. Friends also provides a voice for the River's inhabitants and resources in public affairs. Friends has developed extensive contacts with user groups and private and public landowners throughout the watershed.

3. General Site Information

3.1 Site Description (see Attachment 1: Site Maps and Photographs)

The area encompassed by this Site-Specific Plan includes approximately 4,500 acres of marshland and riparian habitat within the Petaluma River Watershed. The City of Petaluma, at the confluence of the Petaluma River and Lynch Creek, forms the northern boundary of the area included in this plan, with San Pablo Bay forming the southern boundary.

This site consists of a complex mosaic of historic tidal marsh habitat, developed shoreline, brackish tidal riparian edge zones, maintained pastureland, restoration sites, light industrial facilities and urban development. The largest component of this site is the 3,900-acre Petaluma Marsh, one of the largest historic tidal marshes in the north Bay. Within this area, this plan has delineated four Sub-Areas targeted for non-native *Spartina* control based on criteria such as land ownership,

site access, endangered species presence, salt marsh ecology and ISP partnership status. These sub-areas include recently restored tidal marshes, highly complex and diverse historic marsh habitats that include mid marsh sloughs, thin strip marshes along the river's edge, creek channels and mouths, and mixed brackish marshes.

3.2 Infestation Description

The pioneering infestation of *Spartina alterniflora* hybrids in the Petaluma River complex is still very limited in its distribution. The majority of the infestation is located adjacent to a dredging and barge dock facility just downstream of Highway 101 south of Petaluma, with scattered infestations located upstream and downstream this central core. In sum, these infestations cover approximately 0.2 acres scattered over this very large marshland complex, which is equal to less than 0.01% of the area. Individual Sub-Area descriptions of the infestation in the Petaluma River Complex are provided in Section 6 of this document.

4. Ecological Threat /Purpose and Need for Project

The Petaluma River Complex currently has a very sparse population of *S. alterniflora* hybrids. The plants are located in a loosely centralized hub within a large, intact marsh system composed of native *S. foliosa* and associated brackish tidal marsh flora. Many of the marshes within this Complex are home to healthy breeding populations of endangered California clapper rail. Control of *S. alterniflora* within this Complex will avoid increased hybridization between the two *Spartina* species, eliminate the potential degradation of the habitat for the clapper rail, and remove a potential source of propagules from the Petaluma River watershed and the still lightly-infested San Pablo Bay.

The loss of approximately 85 to 90 percent of the tidal marsh in the San Francisco Estuary as a whole has led to dramatic losses of fish and wildlife in tidal marsh habitat, decreased water quality and increased turbidity in the Bay. As part of the region-wide effort to restore habitat lost in the Estuary, restoration efforts are being undertaken by various groups within the Petaluma River Watershed and within San Pablo Bay. The 160-acre restoration site called Grey's Field (Sub-area 24b), is just such an effort to restore habitat value to the San Francisco Estuary, and this site is directly threatened by the presence of non-native *Spartina* within the marsh and at adjacent sites. Since this restoration site is currently but lightly vegetated, it is highly vulnerable to invasion by non-native *Spartina* due to a lack of biotic resistance. It is essential to reduce this invasion potential by eradicating all of the currently small populations of invasive *Spartina* within the Petaluma River Complex. Additionally, the large, sprawling complex of sloughs, creeks, and marshland that makes up Petaluma Marsh is of regional significance as a historic ecological refuge for wildlife of all kinds as well as the people of California. The introduction and uncontrolled spread of non-native *Spartina* within this area would severely degrade this valuable resource. Arresting and reversing the invasion of non-native *Spartina* may no longer be feasible once this hybrid invader has spread and become established, due to the aerial extent of the invasion, complexity of control within the salt marsh system, and the effects of hybridization.

The two parent species of the hybrid (the native *S. foliosa* and non-native *S. alterniflora*) have little pollination timing overlap, so first generation crosses are infrequent. However, since the hybrids have a much wider range of flowering times, seeds produced by native plants that are in the vicinity of *S. alterniflora* hybrids are themselves hybrid. These hybrid plants produce up to 21 times more pollen than the native *S. foliosa*, and with higher fertility. This superior hybrid pollen production serves to overwhelm the native *S. foliosa* in a process referred to as 'pollen swamping', resulting in native stands producing mostly hybrid back-cross seed. New stands of hybrid *Spartina* in proximity to *S. foliosa* can thereby act as a reproductive bridge between the species, quickly spreading the invasion around the Bay, and eventually converting any native *S. foliosa*

stands to a range of hybrid forms. This hybrid assimilation could eventually lead to the extinction of the genetically pure native *S. foliosa* and the unique habitat values it produces. There are significant stands of currently intact native *S. foliosa* throughout the Petaluma River Watershed that could be assimilated into an untreated hybrid swarm.

These highly aggressive, invasive *Spartina* hybrids readily expand into new areas including tidal mudflats, recently restored marsh, and even into established *S. foliosa*/ pickleweed (*Salicornia* spp.) stands in remnant native marsh. These invasions can have significant consequences for the plant communities of the marsh as well as the wildlife habitat they provide. *S. alterniflora* and its hybrids are able to survive in a much broader range of conditions than the native *S. foliosa*, including areas of the marsh below which other vascular plants are absent due to submergence intolerance, high wind and wave energy environments, and other environmental factors. The result is the conversion of tidal mud flats into invasive cordgrass meadows and the elimination of critical foraging habitat for migratory shorebirds on the Pacific Flyway, as well as residents such as the endangered California clapper rail (*Rallus longirostris obsoletus*). The permanent alterations to the existing native plant communities of the salt marsh may also serve to preclude the recovery of other threatened and endangered species in the Bay.

Tidal sloughs and channels can become choked with invasive cordgrass and the associated excess trapped sediment, which will have significant consequences both ecologically and in regards to drainage and flood control management. Invasive *Spartina* will impede the movement of fish and wildlife using these marsh corridors, and increase the need for regular dredging and vegetation management to prevent upstream flooding due to the impediments to efficient stream discharge. In addition, the substantial plant biomass produced by invasive *Spartina* becomes floating debris (wrack) in the winter. Massive deposits of this material can clog tidegates and other water control structures (thereby increasing annual maintenance costs), and can also smother areas of the high salt marsh.

5. Alternatives

5.1 No Action Alternative

The No Action Alternative (NAA) would not implement coordinated treatment in an effort to control non-native *Spartina* on the Sub-Areas included within this Site-Specific Plan. Friends of the Petaluma River would manage the infestation when personnel availability, political will, and funding allowed. The scope, extent and persistence of these measures are not known.

ISP monitoring of the populations of *S. alterniflora* around the Bay over the period from 2001-2003 showed significantly increasing rates of expansion within the three-year scope of the monitoring project. For *S. alterniflora* hybrids, the Bay-wide mean expansion rate was found to be 317% over that period. Given the vigorous expansion of the hybrid population of *S. alterniflora* in the Estuary, it is likely that the current infestation, left uncontrolled, will grow and come to dominate areas of the Petaluma River Complex within the next 10 years, resulting in losses to wetland functions and values over hundreds of acres of marsh. Such a rapid change in the structure and function of these marshland areas will almost certainly result in decreased habitat value, increased sedimentation, clogged channels and other significant impacts.

5.2 Proposed Action (Treatment Plan)

The Proposed Action of this Site-Specific Plan would implement a complete treatment of non-native *Spartina* plants within the four Sub-Areas covered under this plan. Treatment would occur via the use of glyphosate or imazapyr herbicide, digging and/or covering. The proposed action will take place during the 2007 Control Season, after which a new 3-year plan will be developed

as necessary to implement annual monitoring for re-establishing plants and periodic control. The proposed action for each Sub-Area is presented in detail in Section 6.

6. Sub-Area Approach and Environmental Assessment

The following sections provide details for each sub-area, including a description of the site and infestation, treatment plans for 2005-2007, and an assessment of the potential environmental impacts to species of concern, cultural resources, visual resources, and adjacent land uses.

Sub-Area 24a: Petaluma: Petaluma River - Lynch Creek Confluence to Grey's Field

Sub-Area Description

Physical Description

This sub-area of the Petaluma River Complex is centered around the City of Petaluma. As such much of this area is heavily developed shoreline with rip-rapped or filled riverside. There is heavy and light industry in the area, as well as commercial districts, docks and marinas, and an overpass for CA-101. The northern portion of the property is defined by the confluence of the main river system and Lynch Creek, and the southern boundary is at the northwestern end of the restoration marsh known as Grey's Field. A portion of this area includes Schollenberger Park, a newly restored wetland within the City of Petaluma.

Spartina Infestation Description

The riverside habitats contained in this sub-area are very lightly infested, with only scattered *Spartina alterniflora* hybrid clones dispersed at specific spots along shoreline. Clones have been identified the docks in Petaluma near the Shamrock and Pomeroy facilities, near the Petaluma Marina, and along both banks of the river in the Schollenberger Park area near Haystack. There is an estimated 0.1 acre of *Spartina alterniflora* hybrids within Sub-Area 24a, or less than 0.01% of the marsh.

Treatment Plan 2007

Management Objectives

The objective for the 2007 treatment season is to treat all identified *S. alterniflora* hybrid plants along the shoreline of Petaluma River, including the areas around the Petaluma Marina and the Haystack area. After treatment, these areas will be monitored for treatment efficacy and additional *Spartina* locations by both the ISP's Mapping and Monitoring Program and the Friends of the Petaluma River.

Treatment Method

The *S. alterniflora* hybrid infestation Petaluma Sub-Area has been evaluated by the ISP to determine the most appropriate treatment methods for the conditions present at the site. Analysis of treatment method efficacy, impacts to sensitive marsh habitat, cost of treatment, hazards to personnel, follow-up required, and other considerations were used to determine the approach to treatment.

The pioneering infestation of *S. alterniflora* is widely scattered in this area as described above. The locations of these infestations (in sensitive marshland and endangered species habitat), and the scattered distribution of the infestation, indicate that the most appropriate method for controlling the *Spartina* infestation on this site is via the application of an aquatic herbicide formulation

(either glyphosate (Aquamaster®), or imazapyr (Habitat®)). This herbicide will be applied using a shallow-bottomed boat or backpack sprayers.

Alternately, at appropriate sites along the riverside, digging of small, individual clones may be undertaken. Covering strategies may also be employed where the structure of the infested area will enable long-term placement of covering fabric without the threat of wave energy displacing the material.

Treatment Strategy

The Friends of the Petaluma River and/or contracted crews will treat all known locations of *S. alterniflora* hybrids in the Petaluma Sub-Area following September 1, the beginning of the treatment season in California clapper rail-occupied habitat. Boats will be used to treat *Spartina* in hard to access areas of the marsh where treatment by ground-based treatment is impossible. The remaining scattered *Spartina* patches that are accessible on foot will be treated using backpack sprayers, with the applicator walking the marsh to apply the herbicide. These two delivery systems will be used to treat all non-native *Spartina* shown on the ISP's 2007 *Spartina* Inventory Map, and any additional plants identified.

Access and Timing

The treatment areas will be accessed by boat from the Petaluma Marina. Boats equipped with spray apparatus will apply the herbicide from the water adjacent to the marsh, and will also be used to transfer equipment and ground personnel to other application sites. Ground crews will access the site via appropriate levees or roads accessing the infested areas of the riverside. Once at the marsh edge, applicators using the backpack sprayers will access the *Spartina* infestations on foot. Applicators will need to be in the lower marsh to treat the *S. alterniflora* clones at low tide for proper dry times and coverage.

Treatment will be scheduled to begin as early as September 1 on this site, at low tide, following the completion of environmental documentation and permitting. This timing follows the end of the breeding season of the California clapper rail (February 1 through August 31). A detailed treatment schedule will be completed prior to the initiation of work, and is included in Attachment 2.

Equipment and Materials

Herbicide Application – A combination of two herbicide delivery systems may be employed at Sub-Area 24a as described below. All personnel in the marsh for treatment operations will be trained in endangered species recognition, and in general marsh safety. All herbicide applicators will have access to spill control materials and will be trained in their use. Additional supplies should include extra water for applications and eyewash, as well as protective clothing including jumpsuits, masks, gloves, goggles, drinking water, first aid kits suitable for the work being done, and a change of clothes.

All applications will follow the herbicide label and Material Safety Data Sheets (MSDS) for the product(s) used, and minimum Spill Prevention and Response protocols (Attachment 4) will be in place prior to, and during treatment.

- *Shallow-bottomed boats:* Boats will be used at sites where access to the infested area of the marsh is either more efficient or is only feasible from the water. Shallow-bottomed craft are better suited to the tidal channels and mudflats adjacent to the marsh than traditional boats that require deeper water; watercraft may include fan or airboats and well as those with an outboard motor. These boats will be equipped with spray apparatus including tanks, spray guns, booms, or a combination thereof, and can be used to directly treat

the *Spartina* plants, or to simply ferry tools and supplies to personnel within the treatment area.

- *Backpack sprayers*: Applicators will wear 4-gallon, pump-action-manual or motorized backpack sprayers containing a tank mix of herbicide, water, surfactant and dye. Personnel can directly access discrete areas in the marsh using this technique, and apply the herbicide mixture by hand in a targeted manner capable of reducing/eliminating off-target plant damage. This delivery system is most appropriate for smaller infestations, newly establishing clones, or follow-up efforts to previous control work. Appropriate support vehicles (truck or boat) will be on site to replenish the herbicide mixture from a larger central tank, enhancing efficiency and safety.

Manual Digging – A general description of the equipment and materials needed for the treatment method follows. All personnel in the marsh for treatment operations will be trained in endangered species recognition, and in general marsh safety. Manual digging will require conventional gardening tools such as a pointed or round point shovel or similar, rubber boots (preferably with steel shank and toe) or hip waders, work clothing, protective eyewear, contractor-grade garbage bags, and in some cases a wheelbarrow for transporting removed material. An area will be set aside above the high tide line to allow for storage and desiccation of the plant material, or provisions will be made for disposal of the material at a landfill.

Geotextile Covering – A general description of the equipment and materials needed for the treatment method follows. All personnel in the marsh for treatment operations will be trained in endangered species recognition, and in general marsh safety. Covering small patches requires the use of rolls of geotextile fabric secured tightly to the substrate with stakes to smother the plants. The *Spartina* is stamped down or mowed with a brush-cutter to allow the fabric to be as close to the ground as possible. The fabric (or tarps) is rolled out over the *Spartina* patch, and small slits are made to accommodate the stakes. Using a hammer, the 4 in X 1 in X 4ft long stakes are driven into the substrate at an angle, and then pulled back to stretch the fabric tightly against the ground, and hammered in completely. Additional stakes must be driven in at right angles to each other to hold down the center of the fabric, and large material such as pieces of rip-rap can be placed on top for extra stabilization.

Sub-Area Environmental Assessment

Affected Environment

There are an estimated 25 acres of marshland within the boundaries defined for this site, consisting of shoreline marsh, mudflats, and high marsh pickleweed habitats. Within this, 0.1 acre of non-native *Spartina* will be targeted for removal under this plan, representing less than 0.01% of the marsh.

Special Status Species

The ISP PEIS/R identified 47 sensitive species of plants and animals that could occur within the waters and adjacent lands of the San Francisco Estuary (PEIS/R Appendix F). Of these 47 species, 19 were determined to be at sufficient risk of direct, indirect, or cumulative adverse impacts to require site-specific evaluation and potential mitigation.* The conditions at this site were

* The 19 potentially affected species include: salt marsh harvest mouse, salt marsh wandering shrew, Suisun shrew, California clapper rail, California black rail, Western snowy plover, California least tern, Alameda song sparrow, San Pablo song sparrow, Suisun song sparrow, salt marsh common yellowthroat, Chinook

evaluated to determine the potential presence of these 19 species, and it was concluded that salt marsh harvest mice, California clapper rail, California black rail, western snowy plover, song sparrow, and salt marsh common yellowthroat, are, or may be present, within or adjacent to the proposed treatment area. Based on historical distributions, there is a limited potential of winter and spring run Chinook salmon, and steelhead may occupy adjacent habitats. No other special status species are expected to be present at this site. Potential impacts and required mitigations for these species are summarized below. Additional impacts and mitigation information is included in Attachment 3: Environmental Compliance.

California clapper rail - California clapper rail are known to inhabit the marshes adjacent to this sub-area. The exact number of rail in this area is not currently known. The ISP will conduct rail surveys within this sub-area as appropriate to inform treatment and mitigation measures. At this time, due to the very limited amount of non-native *Spartina* on this site, only the following mitigation measures will be implemented. Should clapper rail surveys indicate that *Spartina* treatment activities will have an impact on rail, or should the size and/or distribution of the non-native *Spartina* in the area increase, additional mitigation measures, such as phased treatment schedules, may be necessary.

The preferred habitat of the California clapper rail (*Rallus longirostris obsoletus*) is subject to direct tidal circulation and is predominantly covered by *Salicornia* sp. and *Spartina foliosa*, abundant high marsh cover, and an intricate network of tidal sloughs which provide forage and cover. *S. foliosa* provides an important canopy and provides nesting material for the rail. Rail use a core habitat area when nesting and generally remain within this area throughout the year. As part of the treatment protocols, it will be assumed that the treatment areas within this plan provide nesting and/or foraging habitat for California clapper rail and, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented.

Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California clapper rail breeding season (BIO-5.1; CM-18)
- For work within the California clapper rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California clapper rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California clapper rail biology, identification, and call detection (BIO-5.1)
- Report any California clapper rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

California black rail – This site contains suitable habitat for the California black rail (*Laterallus jamaicensis coturniculus*) within the area slated for non-native *Spartina* control work under this plan. The black rail utilizes the dense cover of brackish tidal marshes, and prefers mixed *Salicornia* vegetation. They nest in tall grasses and grass-like vegetation as well as mixed *Salicornia* stands well above ordinary high tides. They are especially abundant in areas where tidal creeks dissect the marsh plain, and adjacent vegetation is able to provide adequate cover during high tide events.

salmon, steelhead, delta smelt, Sacramento splittail, soft bird's beak, Suisun thistle, California sea-blite, and harbor seal.

Mitigations for *Spartina* control work within California black rail habitat will conform to those established for the California clapper rail and therefore, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented. Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California black rail breeding season (BIO-5.1; CM-18)
- For work within the California black rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California black rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California black rail biology, identification, and call detection (BIO-5.1)
- Report any California black rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

Salt marsh harvest mouse – As there is suitable salt marsh harvest mouse (*Reithrodontomys raviventris*) habitat within the proposed treatment area, harvest mouse presence will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. Salt marsh harvest mice do not inhabit the lower marsh elevations where most species of invasive *Spartina* are typically found. However, high marsh pickleweed habitat that is suitable habitat for the harvest mouse may have to be traversed during *Spartina* treatment activities. Wherever possible, high marsh pickleweed habitat will be avoided during *Spartina* control work. In addition to the following mitigations, Best Management Practices, including minimizing access routes, will be utilized to assure the reduction of potential impacts to the salt marsh harvest mouse and its habitat:

- Use shortest possible access route through any pickleweed habitat. Flag areas of repeated access (BIO-4.1; CM-15)
- Use protective mats or other covering over pickleweed in areas of repeated access (BIO-4.1; CM-15)
- Assume presence of salt marsh harvest mouse on all suitable sites (CM-14)
- Whenever possible, schedule work after mass mortality events caused by extreme high tides (CM-16)

Song sparrow – The marsh slated for treatment under this plan contains sufficient suitable habitat to support Suisun and San Pablo song sparrows (*Melospiza melodia samuelis* and *M. m. maxillaris*). Song sparrows do not generally inhabit the bayward, *Spartina*-dominated portion of Bay marshes, or unchannelized, *Salicornia*-dominated upper marsh plains. Song sparrows typically inhabit the *Salicornia* zone above the native *Spartina* zone, especially in channels or sloughs where *Grindelia* stands provide song perches and nesting above spring tides. Where *Grindelia* stands are limited, song sparrows may utilize coyote-bush (*Baccharis pilularis*) or mixed *Salicornia*-*Spartina* stands. Song sparrows also forage at low tide in the muds of smaller side channels within the marsh.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of song sparrows during treatment activities as outlined below:

- Report any song sparrow activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)

- Avoid spraying or removing *Grindelia* plants in the marsh
- Watch for song sparrow presence in the work area during early season treatment work (pre-August), especially in the smaller, upper reaches of channels.

Salt marsh common yellowthroat – The proposed treatment area of this site contains suitable habitat for the salt marsh common yellowthroat (*Geothlypis trichas sinuosa*). The salt marsh common yellowthroat inhabits tidal salt and brackish marshes in winter, but breeds in freshwater to brackish marshes and riparian woodlands during spring to early summer. Territories of common yellowthroat often straddle the interface of riparian corridors or marshland and the upland vegetation of weedy fields or grassland.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of common yellowthroat during treatment activities as outlined below:

- Report any salt marsh common yellowthroat activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh

Western snowy plover – Suitable plover habitat exists within or adjacent to portions of this site. The Western snowy plover (*Charadrius alexandrinus nivosus*) uses beaches, tidal flats and salt pans for foraging, which may include shallow probing of the substrate or taking prey from the substrate surface. Snowy plovers roost on the salt pans of dry or partially dry salt evaporators, on barren to sparsely-vegetated interior salt pond levees, and on sandy tidal flats, and young may use adjacent vegetation for hiding and foraging. The natural analogues to these open, unvegetated habitats in San Francisco Bay were extensive sand and shell spits and natural salt ponds prior to modern development.

Plover presence will be assumed for all operations at this site, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. In addition to the following mitigations, Best Management Practices including minimizing access routes will be utilized to assure the reduction of potential impacts to the Western snowy plover and its habitat:

- Survey access levees for nesting Western snowy plover prior to entry (BIO-5.4; CM-20)
- Report any Western snowy plover activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.4)
- Ensure 500-foot buffer around nests for any helicopter activity (BIO-5.5)

Chinook salmon – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and juvenile Chinook salmon (*Oncorhynchus tshawytscha*) of all four runs (winter, spring, fall, and late fall) are indicated year-round in the shallows and off-shore of this site. Juvenile Chinook salmon forage in the intertidal and shallow subtidal areas of tidal marsh mudflats, sloughs, and channel habitats, as well as open bay habitats of eelgrass and shallow sand shoal areas. The distribution of juveniles changes tidally, with fry moving from tidal channels during flood tides to feed in nearshore marshes. Fry disperse along the edges of marshes at the highest points reached by the tide, then retreat into the tidal channels with the receding tide. Smolts congregate in surface waters of main and secondary sloughs and move into shallow subtidal areas to feed. Foraging and/or movement of Chinook salmon will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse affects on estuarine fish (BIO-6.4)

Steelhead – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and winter run steelhead (*Oncorhynchus mykiss irideus*) are indicated offshore of this site. Steelhead are typically found within freshwater streams, rivers and sloughs that they use for spawning, and intertidal marsh areas of the Bay are unlikely to harbor large populations of this species. However, movement of steelhead offshore of this site will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse effects on estuarine fish (BIO-6.4)

Sacramento splittail – The treatment area encompassed by this plan contains suitable habitat for the Sacramento splittail (*Pogonichthys macrolepidotus*). Sacramento splittail inhabit both fresh and brackish water, and are tolerant of a variety of water temperatures, dissolved oxygen levels, and strong water currents. Splittail can be numerous within small dead-end sloughs, those fed by freshwater streams and larger sloughs in the North and Suisun Bays. Juveniles and adults can be found along shallow edgewater areas lined with emergent aquatic vegetation, while adults prefer to spawn in shallow, seasonally inundated vegetation. Site treatment activities will follow the PEIS/R guidelines for minimization of spray drift during treatment activities as outlined below:

- Spray drift near channels shall be minimized and conform to ISP herbicide drift management plan or equivalent (BIO-6.2; CM-13)

Cultural Resources

The Petaluma site will be submitted to the US Department of the Interior, Fish & Wildlife Service Cultural Resources Team (CRT), Sherwood, Oregon in 2007, as appropriate, for Section 106 review. It is expected that CRT will apply “Appendix B” determination to the Petaluma site, after conducting field surveys on the site.

The appearance of cultural resource properties can never be predicted with certainty. There is the potential for subsurface deposits in this project location. Should any cultural deposits be encountered during any phase of the project, work shall halt and the CRT office will be notified. The Regional Archaeologist, or other similarly qualified individual, should make an assessment of the deposits before work may resume in the area of discovery.

Visual Resources

The ISP Site-Specific Control Plan for Petaluma River Complex Sub-Area 24a calls for treatment of 0.1 acre of non-native *Spartina* in scattered locations along the shoreline of the river, which is less than 0.01% of the area. The visual impact of the *Spartina* control at sub-area 24a should be negligible due to the very small size of the treatment areas relative to the large intact native marsh matrix surrounding the site. In addition, the treatment will roughly coincide with the beginning of senescence of some salt marsh plant species as autumn approaches. Scattered patches of dead *Spartina* resulting from the herbicide application should not create a significant visual impact. Although ISP signage has been developed to educate the public about *Spartina* invasion and control in the San Francisco Estuary, permanent/long-term signs will probably not be utilized at sub-area 24a due to the lack of a central infestation, the scattered nature of the many treatment areas, and the low visibility of the site.

Adjacent Land Uses

As this sub-area encompasses the portion of the Petaluma River that runs through the town of Petaluma, the shorelines and channel banks of the Petaluma Sub-Area are adjacent to public and private properties. However, the *Spartina* control methods to be implemented at this site are very

targeted, greatly reducing or eliminating the possibility of producing a negative environmental impact on adjacent lands as a result of the *Spartina* control work. Applicators following the proper protocols to mitigate impacts to the treatment site will simultaneously be reducing/eliminating impacts to adjacent lands.

The following mitigations for potential adjacent land use impacts will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures (See Attachment 3: Environmental Compliance):

- Minimize drift according to ISP drift management plan (HS-3; CM-3, 4)
- Post appropriate signage a minimum of 24 hours pre-treatment (HS-3)
- Avoid scheduling herbicide application near high public use areas during weekends or holidays, or close public access to area 24 hours before and after treatment (HS-3)
- Maintain ISP or approved equivalent Site Safety and Spill Prevention plan on site (HS-4; CM-3, 4, 17)

Since aquatic areas such as the Bay allow for movement of water between sites, water quality issues in one area may translate into water quality issues at adjacent sites. Mitigations related to the actual application of aquatic herbicide formulations will be sufficient to avoid water quality impacts to adjacent areas because of herbicide breakdown or adsorption, as well as dilution from the large volume of the Bay. The other major water quality concern, related to spills, will be mitigated in the same manner for adjacent areas as on the treatment area itself. For both herbicide or petroleum spills, ISP has provided or approved a Spill and Containment Plan to mitigate the degradation of water quality from such an event.

The Site Specific Project Mitigation matrix developed for Petaluma River Complex sub-area 24a identified three possible Water Quality related impacts and their applicable mitigations:

- Apply herbicide directly to plant at low tide and according to label (WQ-1; CM-3, 4)
- Apply under supervision of trained applicator (WQ-2; CM-3)
- Implement spill and containment plan provided or approved by ISP (WQ-2, 3; CM-17)

Sub-Area 24b: Grey's Field

Sub-Area Description

Physical Description

Sub-Area 24b is located downstream of Shollenberger Park on the east side of the Petaluma River and includes the area on the east side of the river known as Grey's field. This marsh area is a newly restored brackish tidal wetland, with wide, shallow, unvegetated mudflats encompassing some 150 acres. The majority of vegetation at this site is confined to the edges of the marsh.

Spartina Infestation Description

Current field survey results and genetic analysis of samples taken from Grey's field indicate no non-native *Spartina* within this marsh area. The description of treatment options and strategy within this section are provided in the event that non-native *Spartina* is identified in this marsh during the 2007 treatment season.

Treatment Plan 2007

Management Objectives

The objective for the 2007 treatment season is to continue monitoring this marsh for any non-native *Spartina* infestations in this newly restored marsh and initiate treatment on all identified stands.

Treatment Method

The *S. alterniflora* hybrid infestation at the Grey's Field Sub-Area has been evaluated by the ISP to determine the most appropriate treatment methods for the conditions present at the site. Analysis of treatment method efficacy, impacts to sensitive marsh habitat, cost of treatment, hazards to personnel, follow-up required, and other considerations were used to determine the approach to treatment.

Any non-native *Spartina* within this marsh will be of very limited distribution and size. The locations of these infestations (in sensitive marshland and potential endangered species habitat), and the small size of the infestation, indicate that the most appropriate method for controlling the *Spartina* infestation on this site is via the application of an aquatic herbicide formulation (either glyphosate (Aquamaster®), or imazapyr (Habitat®)). This herbicide will be applied using a helicopter, shallow-bottomed boat, amphibious tracked vehicle, or by backpack sprayers.

Treatment Strategy

Friends of the Petaluma River and/or contracted crews will treat all known locations of *S. alterniflora* hybrids in the Grey's Field sub-area following September 1, the beginning of the treatment season in California clapper rail-occupied habitat. Amphibious vehicles and boats may be used to treat *Spartina* in hard to access areas of the marsh where treatment by ground is not possible, where the *Spartina* patches are larger than can be feasibly treated with backpack sprayers, or where broadcast treatment from the air is not appropriate due to the small size of the infestation. Remaining, scattered *Spartina* patches that are accessible on foot will be treated using backpack sprayers, with the applicator walking the marsh to apply the herbicide. These four delivery systems will be used to treat all non-native *Spartina* shown on the ISP's 2007 *Spartina* Inventory Map, and any additional plants identified.

Access and Timing

The treatment areas will be accessed by boat from the Petaluma River. Boats equipped with spray apparatus will apply the herbicide from the water adjacent to the marsh, and may be used along with amphibious vehicles to transfer equipment and ground personnel to other application sites. Ground-based crews will access the treatment areas from adjacent levees or paths. Where available, levee maintenance roads will be used to transfer equipment and ground personnel to the actual application sites, and as a staging area for the amphibious vehicle. Amphibious vehicles will enter the marsh at an appropriate point that minimizes the distance needed to travel to the *Spartina* treatment area. Once at the marsh edge, applicators using the backpack sprayers will access the *Spartina* infestations on foot from the adjacent levees. Applicators will need to be in the lower marsh to treat the *S. alterniflora* clones at low tide for proper dry times and coverage.

Ground-based treatment will be scheduled to begin as early as September 1 on this site, at low tide, following the completion of environmental documentation and permitting. This timing follows the end of the breeding season of the California clapper rail (February 1 through August 31). A detailed treatment schedule will be completed prior to the initiation of work, and is included in Attachment 2.

Equipment and Materials

Herbicide Application – A combination of three herbicide delivery systems will be employed at Sub-Area 24b as described below. All personnel in the marsh for treatment operations will be trained in endangered species recognition, and in general marsh safety. All herbicide applicators will have access to spill control materials and will be trained in their use. Additional supplies should include extra water for applications and eyewash, as well as protective clothing including jumpsuits, masks, gloves, goggles, drinking water, first aid kits suitable for the work being done, and a change of clothes.

All applications will follow the herbicide label and Material Safety Data Sheets (MSDS) for the product(s) used, and minimum Spill Prevention and Response protocols (Attachment 4) will be in place prior to, and during treatment.

- *Backpack sprayers:* Applicators will wear 4-gallon, pump-action-manual or motorized backpack sprayers containing a tank mix of herbicide, water, surfactant and dye. Personnel can directly access discrete areas in the marsh using this technique, and apply the herbicide mixture by hand in a targeted manner capable of reducing/eliminating off-target plant damage. This delivery system is most appropriate for smaller infestations, newly establishing clones, or follow-up efforts to previous control work. Appropriate support vehicles (truck or boat) will be on site to replenish the herbicide mixture from a larger central tank, enhancing efficiency and safety.
- *Shallow-bottomed boats:* Boats will be used at sites where access to the infested area of the marsh is either more efficient or is only feasible from the water. Shallow-bottomed craft are better suited to the tidal channels and mudflats adjacent to the marsh than traditional boats that require deeper water; watercraft may include fan or airboats and well as those with an outboard motor. These boats will be equipped with spray apparatus including tanks, spray guns, booms, or a combination thereof, and can be used to directly treat the *Spartina* plants, or to simply ferry tools and supplies to personnel within the treatment area.
- *Amphibious tracked vehicles:* This delivery system utilizes vehicles such as the Hydro-traxx or Argo equipped with herbicide mix tanks and spray apparatus including hand-held spray guns and/or booms. This system will be used for those areas where lower ground pressure impacts are desirable due to the substrate (soft muds or sensitive vegetation), where the *Spartina* patches are larger than can be effectively or efficiently treated with backpack sprayers, or where access by conventional spray truck is impossible. These vehicles can also be used to ferry supplies to personnel working in the marsh, or to safely traverse short stretches of channelized marsh to transport applicators with backpack sprayers.

Sub-Area Environmental Assessment

Affected Environment

Currently, there is no affected environment within this sub-area. If non-native *Spartina* is found in this sub-area during the 2007 treatment season, it will likely be of very limited distribution within the overall marsh area, affecting a small percentage of the marsh.

Special Status Species

The ISP PEIS/R identified 47 sensitive species of plants and animals that could occur within the waters and adjacent lands of the San Francisco Estuary (PEIS/R Appendix F). Of these 47 species, 19 were determined to be at sufficient risk of direct, indirect, or cumulative adverse impacts

to require site-specific evaluation and potential mitigation.* The conditions at this site were evaluated to determine the potential presence of these 19 species, and it was concluded that salt marsh harvest mice, California clapper rail, California black rail, western snowy plover, song sparrow, Sacramento splittail and salt marsh common yellowthroat are, or may be present, within or adjacent to the proposed treatment area. Based on historical distributions, there is a limited potential of winter and spring run Chinook salmon, and steelhead may occupy adjacent habitats. No other special status species are expected to be present at this site. Potential impacts and required mitigations for these species are summarized below. Additional impacts and mitigation information is included in Attachment 3: Environmental Compliance.

California clapper rail - California clapper rail are known to inhabit the marshes in this sub-area. The exact number of rail in this marsh is not currently known. The ISP will conduct rail surveys within this sub-area as appropriate to inform treatment and mitigation measures. At this time, due to the very limited amount of non-native *Spartina* on this site, only the following mitigation measures will be implemented. Should clapper rail surveys indicate that *Spartina* treatment activities will have an impact on rail, or should the size and/or distribution of the non-native *Spartina* in the area increase, additional mitigation measures, such as phased treatment schedules, may be necessary.

The preferred habitat of the California clapper rail (*Rallus longirostris obsoletus*) is subject to direct tidal circulation and is predominantly covered by *Salicornia* sp. and *Spartina foliosa*, abundant high marsh cover, and an intricate network of tidal sloughs which provide forage and cover. *S. foliosa* provides an important canopy and provides nesting material for the rail. Rail use a core habitat area when nesting and generally remain within this area throughout the year. As part of the treatment protocols, it will be assumed that the treatment areas within this plan provide nesting and/or foraging habitat for California clapper rail and, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented.

Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California clapper rail breeding season (BIO-5.1; CM-18)
- For work within the California clapper rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California clapper rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California clapper rail biology, identification, and call detection (BIO-5.1)
- Report any California clapper rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

California black rail – This site contains suitable habitat for the California black rail (*Laterallus jamaicensis coturniculus*) within the area slated for non-native *Spartina* control work under this plan. The black rail utilizes the dense cover of brackish tidal marshes, and prefers mixed *Salicornia* vegetation. They nest in tall grasses and grass-like vegetation as well as mixed *Salicornia*

* The 19 potentially affected species include: salt marsh harvest mouse, salt marsh wandering shrew, Suisun shrew, California clapper rail, California black rail, Western snowy plover, California least tern, Alameda song sparrow, San Pablo song sparrow, Suisun song sparrow, salt marsh common yellowthroat, Chinook salmon, steelhead, delta smelt, Sacramento splittail, soft bird's beak, Suisun thistle, California sea-blite, and harbor seal.

stands well above ordinary high tides. They are especially abundant in areas where tidal creeks dissect the marsh plain, and adjacent vegetation is able to provide adequate cover during high tide events.

Mitigations for *Spartina* control work within California black rail habitat will conform to those established for the California clapper rail and therefore, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented. Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California black rail breeding season (BIO-5.1; CM-18)
- For work within the California black rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California black rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California black rail biology, identification, and call detection (BIO-5.1)
- Report any California black rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

Salt marsh harvest mouse – As there is suitable salt marsh harvest mouse (*Reithrodontomys raviventris*) habitat within the proposed treatment area, harvest mouse presence will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. Salt marsh harvest mice do not inhabit the lower marsh elevations where most species of invasive *Spartina* are typically found. However, high marsh pickleweed habitat that is suitable habitat for the harvest mouse may have to be traversed during *Spartina* treatment activities. Wherever possible, high marsh pickleweed habitat will be avoided during *Spartina* control work. In addition to the following mitigations, Best Management Practices, including minimizing access routes, will be utilized to assure the reduction of potential impacts to the salt marsh harvest mouse and its habitat:

- Use shortest possible access route through any pickleweed habitat. Flag areas of repeated access (BIO-4.1; CM-15)
- Use protective mats or other covering over pickleweed in areas of repeated access (BIO-4.1; CM-15)
- Assume presence of salt marsh harvest mouse on all suitable sites (CM-14)
- Whenever possible, schedule work after mass mortality events caused by extreme high tides (CM-16)

Song sparrow – The marsh slated for treatment under this plan contains sufficient suitable habitat to support Suisun and San Pablo song sparrows (*Melospiza melodia samuelis* and *M. m. maxillaris*). Song sparrows do not generally inhabit the bayward, *Spartina*-dominated portion of Bay marshes, or unchannelized, *Salicornia*-dominated upper marsh plains. Song sparrows typically inhabit the *Salicornia* zone above the native *Spartina* zone, especially in channels or sloughs where *Grindelia* stands provide song perches and nesting above spring tides. Where *Grindelia* stands are limited, song sparrows may utilize coyote-bush (*Baccharis pilularis*) or mixed *Salicornia*-*Spartina* stands. Song sparrows also forage at low tide in the muds of smaller side channels within the marsh.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of song sparrows during treatment activities as outlined below:

- Report any song sparrow activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh
- Watch for song sparrow presence in the work area during early season treatment work (pre-August), especially in the smaller, upper reaches of channels.

Salt marsh common yellowthroat – The proposed treatment area of this site contains suitable habitat for the salt marsh common yellowthroat (*Geothlypis trichas sinuosa*). The salt marsh common yellowthroat inhabits tidal salt and brackish marshes in winter, but breeds in freshwater to brackish marshes and riparian woodlands during spring to early summer. Territories of common yellowthroat often straddle the interface of riparian corridors or marshland and the upland vegetation of weedy fields or grassland.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of common yellowthroat during treatment activities as outlined below:

- Report any salt marsh common yellowthroat activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh

Western snowy plover – Suitable plover habitat exists within or adjacent to portions of this site. The Western snowy plover (*Charadrius alexandrinus nivosus*) uses beaches, tidal flats and salt pans for foraging, which may include shallow probing of the substrate or taking prey from the substrate surface. Snowy plovers roost on the salt pans of dry or partially dry salt evaporators, on barren to sparsely-vegetated interior salt pond levees, and on sandy tidal flats, and young may use adjacent vegetation for hiding and foraging. The natural analogues to these open, unvegetated habitats in San Francisco Bay were extensive sand and shell spits and natural salt ponds prior to modern development.

Plover presence will be assumed for all operations at this site, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. In addition to the following mitigations, Best Management Practices including minimizing access routes will be utilized to assure the reduction of potential impacts to the Western snowy plover and its habitat:

- Survey access levees for nesting Western snowy plover prior to entry (BIO-5.4; CM-20)
- Report any Western snowy plover activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.4)
- Ensure 500-foot buffer around nests for any helicopter activity (BIO-5.5)

Chinook salmon – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and juvenile Chinook salmon (*Oncorhynchus tshawytscha*) of all four runs (winter, spring, fall, and late fall) are indicated year-round in the shallows and off-shore of this site. Juvenile Chinook salmon forage in the intertidal and shallow subtidal areas of tidal marsh mudflats, sloughs, and channel habitats, as well as open bay habitats of eelgrass and shallow sand shoal areas. The distribution of juveniles changes tidally, with fry moving from tidal channels during flood tides to feed in nearshore marshes. Fry disperse along the edges of marshes at the highest points reached by the tide, then retreat into the tidal channels with the receding tide. Smolts congregate in surface waters of main and secondary sloughs and move into shallow subtidal areas to feed. Foraging and/or movement of Chinook salmon will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)

- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse effects on estuarine fish (BIO-6.4)

Steelhead – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and winter run steelhead (*Oncorhynchus mykiss irideus*) are indicated offshore of this site. Steelhead are typically found within freshwater streams, rivers and sloughs that they use for spawning, and intertidal marsh areas of the Bay are unlikely to harbor large populations of this species. However, movement of steelhead offshore of this site will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse effects on estuarine fish (BIO-6.4)

Sacramento splittail – The treatment area encompassed by this plan contains suitable habitat for the Sacramento splittail (*Pogonichthys macrolepidotus*). Sacramento splittail inhabit both fresh and brackish water, and are tolerant of a variety of water temperatures, dissolved oxygen levels, and strong water currents. Splittail can be numerous within small dead-end sloughs, those fed by freshwater streams and larger sloughs in the North and Suisun Bays. Juveniles and adults can be found along shallow edgewater areas lined with emergent aquatic vegetation, while adults prefer to spawn in shallow, seasonally inundated vegetation. Site treatment activities will follow the PEIS/R guidelines for minimization of spray drift during treatment activities as outlined below:

- Spray drift near channels shall be minimized and conform to ISP herbicide drift management plan or equivalent (BIO-6.2; CM-13)

Cultural Resources

The Petaluma site will be submitted to the US Department of the Interior, Fish & Wildlife Service Cultural Resources Team (CRT), Sherwood, Oregon in 2007, as appropriate, for Section 106 review. It is expected that CRT will apply “Appendix B” determination to the Petaluma site, after conducting field surveys on the site.

The appearance of cultural resource properties can never be predicted with certainty. There is the potential for subsurface deposits in this project location. Should any cultural deposits be encountered during any phase of the project, work shall halt and the CRT office will be notified. The Regional Archaeologist, or other similarly qualified individual, should make an assessment of the deposits before work may resume in the area of discovery.

Visual Resources

The ISP Site-Specific Control Plan for Petaluma River Complex sub-area 24b currently calls for no treatment of non-native *Spartina*. If any non-native *Spartina* is found during the 2007 treatments season, the amount will be very small, and as a result, the visual impact of the *Spartina* control at sub-area 24b will be negligible relative to the large intact native marsh matrix surrounding the site, as well as the absence of public access to this site. In addition, the treatment will roughly coincide with the beginning of senescence of some salt marsh plant species as autumn approaches. Scattered patches of dead *Spartina* resulting from the herbicide application should not create a significant visual impact. Although ISP signage has been developed to educate the public about *Spartina* invasion and control in the San Francisco Estuary, permanent/long-term signs will probably not be utilized at sub-area 5b due to the lack of a central infestation, the scattered nature of the many treatment areas, and the low visibility of the site.

Adjacent Land Uses

The marshes, shorelines and channel banks of the Grey's Field sub-area are adjacent to light industrial wastewater treatment facilities, and are not open to public access. The city of Petaluma is located approximately 2.0 miles to the north. Therefore, there will be very little opportunity for the *Spartina* control work in these salt marshes to come into contact with the public, with the main source being incidental viewing from boats on the Petaluma River. The *Spartina* control methods to be implemented at this site are very targeted, greatly reducing or eliminating the possibility of producing a negative environmental impact on adjacent lands as a result of the *Spartina* control work. Applicators following the proper protocols to mitigate impacts to the treatment site will simultaneously be reducing/eliminating impacts to adjacent lands.

The following mitigations for potential adjacent land use impacts will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures (See Attachment 3: Environmental Compliance):

- Minimize drift according to ISP drift management plan (HS-3; CM-3, 4)
- Post appropriate signage a minimum of 24 hours pre-treatment (HS-3)
- Avoid scheduling herbicide application near high public use areas during weekends or holidays, or close public access to area 24 hours before and after treatment (HS-3)
- Maintain ISP or approved equivalent Site Safety and Spill Prevention plan on site (HS-4; CM-3, 4, 17)

Since aquatic areas such as the Bay allow for movement of water between sites, water quality issues in one area may translate into water quality issues at adjacent sites. Mitigations related to the actual application of aquatic herbicide formulations will be sufficient to avoid water quality impacts to adjacent areas because of herbicide breakdown or adsorption, as well as dilution from the large volume of the Bay. The other major water quality concern, related to spills, will be mitigated in the same manner for adjacent areas as on the treatment area itself. For both herbicide or petroleum spills, ISP has provided or approved a Spill and Containment Plan to mitigate the degradation of water quality from such an event.

The Site Specific Project Mitigation matrix developed for Petaluma River complex sub-area 24b identified three possible Water Quality related impacts and their applicable mitigations:

- Apply herbicide directly to plant at low tide and according to label (WQ-1; CM-3, 4)
- Apply under supervision of trained applicator (WQ-2; CM-3)
- Implement spill and containment plan provided or approved by ISP (WQ-2, 3; CM-17)

Sub-Area 24c: Petaluma Marsh

Sub-Area Description

Physical Description

For the purposes of this plan, the Petaluma Marsh sub-area encompasses the roughly 4000 acres of marshland located from the southern end of the restoration marsh called Grey's Field in the north, to the outlet of San Antonio Creek in the South. This area includes all marshlands on both sides of the Petaluma River. The largest portion of this sub-area is the Petaluma Marsh proper, the largest intact marsh system in the San Francisco Bay Estuary. This marsh contains numerous sloughs, pans, small channels, mid-marsh vegetation and other habitats.

Spartina Infestation Description

This area of marsh contains roughly 0.1 acre of *Spartina alterniflora* hybrids along the main river channel, representing less than 0.01% of Sub-Area 24c. The infestation is scattered in only a few locations, in discrete clonal clumps.

Treatment Plan 2007

Management Objectives

The objective for the 2007 treatment season is to fully assess the extent of the non-native *Spartina* infestation in this large marsh and initiate treatment on all identified stands.

Treatment Method

The *S. alterniflora* hybrid infestation within the Petaluma Marsh Sub-Area has been evaluated by the ISP to determine the most appropriate treatment methods for the conditions present at the site. Analysis of treatment method efficacy, impacts to sensitive marsh habitat, cost of treatment, hazards to personnel, follow-up required, and other considerations were used to determine the approach to treatment.

The newly establishing infestation of *S. alterniflora* is scattered throughout this marsh as described above. The locations of these infestations (in sensitive marshland and endangered species habitat), and the scattered distribution of the infestation, indicate that the most appropriate method for controlling the *Spartina* infestation on this site is via the application of an aquatic herbicide formulation (either glyphosate (Aquamaster®), or imazapyr (Habitat®)). This herbicide will be applied using a shallow-bottomed boat.

Treatment Strategy

Friends of the Petaluma River and/or contracted crews will treat all known locations of *S. alterniflora* hybrids in the Petaluma Marsh Sub-Area following September 1, the beginning of the treatment season in California clapper rail-occupied habitat. A shallow-bottomed boat will be used to access the scattered locations of the hybrid *Spartina* within this very large marsh. This delivery system will be used to treat all non-native *Spartina* shown on the ISP's 2007 *Spartina* Inventory Map, and any additional plants identified.

Access and Timing

The treatment areas will be accessed by boat from the edge of the slough. Boats equipped with spray apparatus will apply the herbicide from the water adjacent to the marsh, and will also be used to transfer equipment and ground personnel to other application sites as needed. Applicators will need to be in the lower marsh to treat the *S. alterniflora* clones at low tide for proper dry times and coverage.

Treatment will be scheduled to begin as early as September 1 on this site, at low tide, following the completion of environmental documentation and permitting. This timing follows the end of the breeding season of the California clapper rail (February 1 through August 31). A detailed treatment schedule will be completed prior to the initiation of work, and is included in Attachment 2.

Equipment and Materials

Herbicide Application –A single herbicide delivery system will be employed at Sub-Area 24c as described below. All personnel in the marsh for treatment operations will be trained in endangered species recognition, and in general marsh safety. All herbicide applicators will have access to spill control materials and will be trained in their use. Additional supplies should include extra water for applications and eyewash, as well as protective clothing including jumpsuits, masks, gloves, goggles, drinking water, first aid kits suitable for the work being done, and a change of clothes.

All applications will follow the herbicide label and Material Safety Data Sheets (MSDS) for the product(s) used, and minimum Spill Prevention and Response protocols (Attachment 4) will be in place prior to, and during treatment.

- *Shallow-bottomed boats:* Boats will be used at sites where access to the infested area of the marsh is either more efficient or is only feasible from the water. Shallow-bottomed craft are better suited to the tidal channels and mudflats adjacent to the marsh than traditional boats that require deeper water; watercraft may include fan or airboats and well as those with an outboard motor. These boats will be equipped with spray apparatus including tanks, spray guns, booms, or a combination thereof, and can be used to directly treat the *Spartina* plants, or to simply ferry tools and supplies to personnel within the treatment area.

Sub-Area Environmental Assessment

Affected Environment

The marsh areas that comprise this Sub-Area constitute an estimated 4000 acres of channel banks, sloughs, upper marsh, brackish lagoons and other marshland habitats adjacent to the main stem of the Petaluma River. Within this area, the Site-Specific Plan calls for the removal of 0.1 acre of non-native *Spartina* during 2007. This represents less than 0.01% of the marsh.

Special Status Species

The ISP PEIS/R identified 47 sensitive species of plants and animals that could occur within the waters and adjacent lands of the San Francisco Estuary (PEIS/R Appendix F). Of these 47 species, 19 were determined to be at sufficient risk of direct, indirect, or cumulative adverse impacts to require site-specific evaluation and potential mitigation.* The conditions at this site were evaluated to determine the potential presence of these 19 species, and it was concluded that salt marsh harvest mice, Suisun shrew, California clapper rail, California black rail, Western snowy plover, song sparrow, Sacramento splittail and salt marsh common yellowthroat are, or may be present, within or adjacent to the proposed treatment area. Based on historical distributions, there is a limited potential of winter and spring run Chinook salmon, and steelhead may occupy adja-

* The 19 potentially affected species include: salt marsh harvest mouse, salt marsh wandering shrew, Suisun shrew, California clapper rail, California black rail, Western snowy plover, California least tern, Alameda song sparrow, San Pablo song sparrow, Suisun song sparrow, salt marsh common yellowthroat, Chinook salmon, steelhead, delta smelt, Sacramento splittail, soft bird's beak, Suisun thistle, California sea-blite, and harbor seal.

cent habitats. No other special status species are expected to be present at this site. Potential impacts and required mitigations for these species are summarized below. Additional impacts and mitigation information is included in Attachment 3: Environmental Compliance.

California clapper rail - California clapper rail are known to inhabit the marshes in this sub-area. The exact number of rail in this marsh is not currently known. The ISP will conduct rail surveys within this sub-area as appropriate to inform treatment and mitigation measures. At this time, due to the very limited amount of non-native *Spartina* on this site, only the following mitigation measures will be implemented. Should clapper rail surveys indicate that *Spartina* treatment activities will have an impact on rail, or should the size and/or distribution of the non-native *Spartina* in the area increase, additional mitigation measures, such as phased treatment schedules, may be necessary.

The preferred habitat of the California clapper rail (*Rallus longirostris obsoletus*) is subject to direct tidal circulation and is predominantly covered by *Salicornia* sp. and *Spartina foliosa*, abundant high marsh cover, and an intricate network of tidal sloughs which provide forage and cover. *S. foliosa* provides an important canopy and provides nesting material for the rail. Rail use a core habitat area when nesting and generally remain within this area throughout the year. As part of the treatment protocols, it will be assumed that the treatment areas within this plan provide nesting and/or foraging habitat for California clapper rail and, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented.

Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California clapper rail breeding season (BIO-5.1; CM-18)
- For work within the California clapper rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California clapper rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California clapper rail biology, identification, and call detection (BIO-5.1)
- Report any California clapper rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

California black rail – This site contains suitable habitat for the California black rail (*Laterallus jamaicensis coturniculus*) within the area slated for non-native *Spartina* control work under this plan. The black rail utilizes the dense cover of brackish tidal marshes, and prefers mixed *Salicornia* vegetation. They nest in tall grasses and grass-like vegetation as well as mixed *Salicornia* stands well above ordinary high tides. They are especially abundant in areas where tidal creeks dissect the marsh plain, and adjacent vegetation is able to provide adequate cover during high tide events.

Mitigations for *Spartina* control work within California black rail habitat will conform to those established for the California clapper rail and therefore, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented. Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California black rail breeding season (BIO-5.1; CM-18)

- For work within the California black rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California black rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California black rail biology, identification, and call detection (BIO-5.1)
- Report any California black rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

Salt marsh harvest mouse – As there is suitable salt marsh harvest mouse (*Reithrodontomys raviventris*) habitat within the proposed treatment area, harvest mouse presence will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. Salt marsh harvest mice do not inhabit the lower marsh elevations where most species of invasive *Spartina* are typically found. However, high marsh pickleweed habitat that is suitable habitat for the harvest mouse may have to be traversed during *Spartina* treatment activities. Wherever possible, high marsh pickleweed habitat will be avoided during *Spartina* control work. In addition to the following mitigations, Best Management Practices, including minimizing access routes, will be utilized to assure the reduction of potential impacts to the salt marsh harvest mouse and its habitat:

- Use shortest possible access route through any pickleweed habitat. Flag areas of repeated access (BIO-4.1; CM-15)
- Use protective mats or other covering over pickleweed in areas of repeated access (BIO-4.1; CM-15)
- Assume presence of salt marsh harvest mouse on all suitable sites (CM-14)
- Whenever possible, schedule work after mass mortality events caused by extreme high tides (CM-16)

Suisun shrew – This site contains suitable habitat for the Suisun shrew (*Sorex ornatus sinuosis*) within the area slated for non-native *Spartina* control under this plan. This shrew species uses wet, medium-high salt marshes where they are provided dense, low cover, an abundant invertebrate food source, and nesting sites, which may include native *Spartina* marsh. Suisun shrew prefer areas of mixed driftwood and *Salicornia* within the wet middle marsh, and may use dryer high marsh areas for refugia during extreme high tide events.

In addition to the following mitigations, which conform to those established for the endangered salt marsh harvest mouse, Best Management Practices, including minimizing access routes, will be utilized to assure the reduction of potential impacts to the Suisun shrew and its habitat:

- Use shortest possible access route through any pickleweed habitat. Flag areas of repeated access (BIO-4.1; CM-15)
- Use protective mats or other covering over pickleweed in areas of repeated access (BIO-4.1; CM-15)
- Assume presence of Suisun shrew on all suitable sites (CM-14)
- Whenever possible, schedule work after mass mortality events caused by extreme high tides (CM-16)

Song sparrow – The marsh slated for treatment under this plan contains sufficient suitable habitat to support Suisun and San Pablo song sparrows (*Melospiza melodia samuelis* and *M. m.maxillaris*). Song sparrows do not generally inhabit the bayward, *Spartina*-dominated portion of Bay marshes, or unchannelized, *Salicornia*-dominated upper marsh plains. Song sparrows typically inhabit the *Salicornia* zone above the native *Spartina* zone, especially in channels or

sloughs where *Grindelia* stands provide song perches and nesting above spring tides. Where *Grindelia* stands are limited, song sparrows may utilize coyote-bush (*Baccharis pilularis*) or mixed *Salicornia-Spartina* stands. Song sparrows also forage at low tide in the muds of smaller side channels within the marsh.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of song sparrows during treatment activities as outlined below:

- Report any song sparrow activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh
- Watch for song sparrow presence in the work area during early season treatment work (pre-August), especially in the smaller, upper reaches of channels.

Salt marsh common yellowthroat – The proposed treatment area of this site contains suitable habitat for the salt marsh common yellowthroat (*Geothlypis trichas sinuosa*). The salt marsh common yellowthroat inhabits tidal salt and brackish marshes in winter, but breeds in freshwater to brackish marshes and riparian woodlands during spring to early summer. Territories of common yellowthroat often straddle the interface of riparian corridors or marshland and the upland vegetation of weedy fields or grassland.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of common yellowthroat during treatment activities as outlined below:

- Report any salt marsh common yellowthroat activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh

Western snowy plover – Suitable plover habitat exists within or adjacent to portions of this site. The Western snowy plover (*Charadrius alexandrinus nivosus*) uses beaches, tidal flats and salt pans for foraging, which may include shallow probing of the substrate or taking prey from the substrate surface. Snowy plovers roost on the salt pans of dry or partially dry salt evaporators, on barren to sparsely-vegetated interior salt pond levees, and on sandy tidal flats, and young may use adjacent vegetation for hiding and foraging. The natural analogues to these open, unvegetated habitats in San Francisco Bay were extensive sand and shell spits and natural salt ponds prior to modern development.

Plover presence will be assumed for all operations at this site, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. In addition to the following mitigations, Best Management Practices including minimizing access routes will be utilized to assure the reduction of potential impacts to the Western snowy plover and its habitat:

- Survey access levees for nesting Western snowy plover prior to entry (BIO-5.4; CM-20)
- Report any Western snowy plover activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.4)
- Ensure 500-foot buffer around nests for any helicopter activity (BIO-5.5)

Chinook salmon – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and juvenile Chinook salmon (*Oncorhynchus tshawytscha*) of all four runs (winter, spring, fall, and late fall) are indicated year-round in the shallows and off-shore of this site. Juvenile Chinook salmon forage in the intertidal and shallow subtidal areas of tidal marsh mudflats, sloughs, and channel habitats, as well as open bay habitats of eelgrass and shallow sand shoal areas. The distribution of juveniles changes tidally, with fry moving from tidal channels during flood tides to feed in nearshore marshes. Fry disperse along the edges of marshes

at the highest points reached by the tide, then retreat into the tidal channels with the receding tide. Smolts congregate in surface waters of main and secondary sloughs and move into shallow sub-tidal areas to feed. Foraging and/or movement of Chinook salmon will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse effects on estuarine fish (BIO-6.4)

Steelhead – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and winter run steelhead (*Oncorhynchus mykiss irideus*) are indicated offshore of this site. Steelhead are typically found within freshwater streams, rivers and sloughs that they use for spawning, and intertidal marsh areas of the Bay are unlikely to harbor large populations of this species. However, movement of steelhead offshore of this site will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse effects on estuarine fish (BIO-6.4)

Sacramento splittail – The treatment area encompassed by this plan contains suitable habitat for the Sacramento splittail (*Pogonichthys macrolepidotus*). Sacramento splittail inhabit both fresh and brackish water, and are tolerant of a variety of water temperatures, dissolved oxygen levels, and strong water currents. Splittail can be numerous within small dead-end sloughs, those fed by freshwater streams and larger sloughs in the North and Suisun Bays. Juveniles and adults can be found along shallow edgewater areas lined with emergent aquatic vegetation, while adults prefer to spawn in shallow, seasonally inundated vegetation. Site treatment activities will follow the PEIS/R guidelines for minimization of spray drift during treatment activities as outlined below:

- Spray drift near channels shall be minimized and conform to ISP herbicide drift management plan or equivalent (BIO-6.2; CM-13)

Cultural Resources

The Petaluma site will be submitted to the US Department of the Interior, Fish & Wildlife Service Cultural Resources Team (CRT), Sherwood, Oregon in 2007, as appropriate, for Section 106 review. It is expected that CRT will apply “Appendix B” determination to the Petaluma site, after conducting field surveys on the site.

The appearance of cultural resource properties can never be predicted with certainty. There is the potential for subsurface deposits in this project location. Should any cultural deposits be encountered during any phase of the project, work shall halt and the CRT office will be notified. The Regional Archaeologist, or other similarly qualified individual, should make an assessment of the deposits before work may resume in the area of discovery.

Visual Resources

The ISP Site-Specific Control Plan for the Petaluma River Complex sub-area 24c calls for treatment of 0.1 acre in very few scattered locations throughout the marsh along the main river channel, which is less than 0.01% of the area. The visual impact of the *Spartina* control at sub-area 24c should be negligible due to the very small size of the treatment areas relative to the large intact native marsh matrix surrounding the site. In addition, the treatment will roughly coincide with the beginning of senescence of some salt marsh plant species as autumn approaches. Scattered patches of dead *Spartina* resulting from the herbicide application should not create a significant

visual impact. Although ISP signage has been developed to educate the public about *Spartina* invasion and control in the San Francisco Estuary, permanent/long-term signs will probably not be utilized at sub-area 5c due to the lack of a central infestation and the scattered nature of the many treatment areas. During the control work, temporary signage will be in place to explain the ecology of the *Spartina* invasion, the purpose behind the control work, and the methods being used. These temporary signs will also have contact information for further questions, and the ISP website address.

Adjacent Land Uses

The infestations of non-native *Spartina* within this sub-area are located near or on the main channel of the Petaluma River, and are distant (roughly 1 mile) from adjacent land uses. These uses include a county dump facility and cattle ranching. The amount of non-native *Spartina* requiring control within this Sub-Area is unlikely to affect either of these land uses.

The *Spartina* control methods to be implemented at this site are very targeted, greatly reducing or eliminating the possibility of producing a negative environmental impact on adjacent lands as a result of the *Spartina* control work. Applicators following the proper protocols to mitigate impacts to the treatment site will simultaneously be reducing/eliminating impacts to adjacent lands. However, since Sub-Area 5c provides recreational opportunities right up to the marsh edge (in the vicinity of the *Spartina* control work), it may be necessary to restrict access by closing the public trail system during the herbicide treatment. ISP will work with DENWR to determine the best way to temporarily close the treatment areas 24 hours before and after the herbicide application so as to mitigate impacts to human health and safety.

The following mitigations for potential adjacent land use impacts will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures (See Attachment 3: Environmental Compliance):

- Minimize drift according to ISP drift management plan (HS-3; CM-3, 4)
- Post appropriate signage a minimum of 24 hours pre-treatment (HS-3)
- Avoid scheduling herbicide application near high public use areas during weekends or holidays, or close public access to area 24 hours before and after treatment (HS-3)
- Maintain ISP or approved equivalent Site Safety and Spill Prevention plan on site (HS-4; CM-3, 4, 17)

Since aquatic areas such as the Bay allow for movement of water between sites, water quality issues in one area may translate into water quality issues at adjacent sites. Mitigations related to the actual application of aquatic herbicide formulations will be sufficient to avoid water quality impacts to adjacent areas because of herbicide breakdown or adsorption, as well as dilution from the large volume of the Bay. The other major water quality concern, related to spills, will be mitigated in the same manner for adjacent areas as on the treatment area itself. For both herbicide or petroleum spills, ISP has provided or approved a Spill and Containment Plan to mitigate the degradation of water quality from such an event.

The Site-Specific Project Mitigation matrix developed for Petaluma River complex sub-area 24c identified three possible Water Quality related impacts and their applicable mitigations:

- Apply herbicide directly to plant at low tide and according to label (WQ-1; CM-3, 4)
- Apply under supervision of trained applicator (WQ-2; CM-3)
- Implement spill and containment plan provided or approved by ISP (WQ-2, 3; CM-17)

Sub-Area 24d: Lower Petaluma River: San Antonio Creek to River Mouth

Sub-Area Description

Physical Description

The Lower Petaluma River sub-area is a 225-acre stretch of riverside salt marsh habitat from the confluence of the Petaluma River and San Antonio Creek to the mouth of the river. Within this area are large sloughs like Black John Slough and wide marsh areas extending back from the river's edge to the cultivated farmland beyond.

Spartina Infestation Description

Current field survey results and genetic analysis of samples taken from this stretch of the Petaluma River indicate no non-native *Spartina* within the marsh areas along the river banks. The description of treatment options and strategy within this section are provided in the event that non-native *Spartina* is identified in this marsh during the 2007 treatment season.

Treatment Plan 2007

Management Objectives

The objective for the 2007 treatment season is to fully assess the extent of the non-native *Spartina* infestation along the lower portions of the river and initiate treatment on all identified stands.

Treatment Method

The potential *S. alterniflora* hybrid infestation at the Lower Petaluma River Sub-Area has been evaluated by the ISP to determine the most appropriate treatment methods for the conditions present at the site. Analysis of treatment method efficacy, impacts to sensitive marsh habitat, cost of treatment, hazards to personnel, follow-up required, and other considerations were used to determine the approach to treatment.

If non-native *Spartina* is discovered within this sub-areas, it will be a newly establishing infestation very lightly scattered along the shoreline of the river. The locations of these infestations (in sensitive marshland and endangered species habitat), and the scattered distribution of the infestation, would indicate that the most appropriate method for controlling the *Spartina* infestation on this site is via the application of an aquatic herbicide formulation (either glyphosate (Aquamaster®), or imazapyr (Habitat®)). This herbicide will be applied using a shallow-bottomed boat or via backpack.

Treatment Strategy

The Friends of the Petaluma River and/or contracted crews will treat all known locations of *S. alterniflora* hybrids in the Lower Petaluma River Sub-Area following September 1, the beginning of the treatment season in California clapper rail-occupied habitat. Shallow-bottomed boats will be used to treat all scattered *Spartina* patches and as a base for applicators with backpack sprayers where necessary. The applicators using both systems apply the herbicide from the water.. These two delivery systems will be used to treat all non-native *Spartina* shown on the ISP's 2007 *Spartina* Inventory Map, and any additional plants identified.

Access and Timing

Crews will access the treatment areas via the Petaluma River from the marina on the east side of the river mouth or the boat launch on the west side. Applicators will need to be in the lower marsh to treat the *S. alterniflora* hybrid clones at low tide for proper dry times and coverage.

Treatment will be scheduled to begin as early as September 1 on this site, at low tide, following the completion of environmental documentation and permitting. This timing follows the end of the breeding season of the California clapper rail (February 1 through August 31). A detailed treatment schedule will be completed prior to the initiation of work, and is included in Attachment 2.

Equipment and Materials

Herbicide Application – A combination of two herbicide delivery systems will be employed at Sub-Area 24d as described below. All personnel in the marsh for treatment operations will be trained in endangered species recognition, and in general marsh safety. All herbicide applicators will have access to spill control materials and will be trained in their use. Additional supplies should include extra water for applications and eyewash, as well as protective clothing including jumpsuits, masks, gloves, goggles, drinking water, first aid kits suitable for the work being done, and a change of clothes.

All applications will follow the herbicide label and Material Safety Data Sheets (MSDS) for the product(s) used, and minimum Spill Prevention and Response protocols (Attachment 4) will be in place prior to, and during treatment.

- *Backpack sprayers:* Applicators will wear 4-gallon, pump-action-manual or motorized backpack sprayers containing a tank mix of herbicide, water, surfactant and dye. Personnel can directly access discrete areas in the marsh using this technique, and apply the herbicide mixture by hand in a targeted manner capable of reducing/eliminating off-target plant damage. This delivery system is most appropriate for smaller infestations, newly establishing clones, or follow-up efforts to previous control work. Appropriate support vehicles (truck or boat) will be on site to replenish the herbicide mixture from a larger central tank, enhancing efficiency and safety.
- *Shallow-bottomed boats:* Boats will be used at sites where access to the infested area of the marsh is either more efficient or is only feasible from the water. Shallow-bottomed craft are better suited to the tidal channels and mudflats adjacent to the marsh than traditional boats that require deeper water; watercraft may include fan or airboats and well as those with an outboard motor. These boats will be equipped with spray apparatus including tanks, spray guns, booms, or a combination thereof, and can be used to directly treat the *Spartina* plants, or to simply ferry tools and supplies to personnel within the treatment area.

Sub-Area Environmental Assessment

Affected Environment

Currently, there is no affected environment within this sub-area. If non-native *Spartina* is found in this sub-area during the 2007 treatment season, it will likely be of very limited distribution within the overall marsh area, affecting a small percentage of the marsh.

Special Status Species

The ISP PEIS/R identified 47 sensitive species of plants and animals that could occur within the waters and adjacent lands of the San Francisco Estuary (PEIS/R Appendix F). Of these 47 species, 19 were determined to be at sufficient risk of direct, indirect, or cumulative adverse impacts to require site-specific evaluation and potential mitigation.* The conditions at this site were

* The 19 potentially affected species include: salt marsh harvest mouse, salt marsh wandering shrew, Suisun shrew, California clapper rail, California black rail, Western snowy plover, California least tern, Alameda song sparrow, San Pablo song sparrow, Suisun song sparrow, salt marsh common yellowthroat, Chinook

evaluated to determine the potential presence of these 19 species, and it was concluded that salt marsh harvest mice, Suisun shrew, California clapper rail, California black rail, Western snowy plover, song sparrow, Sacramento splittail and salt marsh common yellowthroat are, or may be present, within or adjacent to the proposed treatment area. Based on historical distributions, there is a limited potential of winter and spring run Chinook salmon in adjacent habitats. No other special status species are expected to be present at this site. Potential impacts and required mitigations for these species are summarized below. Additional impacts and mitigation information is included in Attachment 3: Environmental Compliance.

California clapper rail - California clapper rail are known to inhabit the marshes in this sub-area. The exact number of rail in this marsh is not currently known. The ISP will conduct rail surveys within this sub-area as appropriate to inform treatment and mitigation measures. At this time, due to the very limited amount of non-native *Spartina* on this site, only the following mitigation measures will be implemented. Should clapper rail surveys indicate that *Spartina* treatment activities will have an impact on rail, or should the size and/or distribution of the non-native *Spartina* in the area increase, additional mitigation measures, such as phased treatment schedules, may be necessary.

The preferred habitat of the California clapper rail (*Rallus longirostris obsoletus*) is subject to direct tidal circulation and is predominantly covered by *Salicornia* sp. and *Spartina foliosa*, abundant high marsh cover, and an intricate network of tidal sloughs which provide forage and cover. *S. foliosa* provides an important canopy and provides nesting material for the rail. Rail use a core habitat area when nesting and generally remain within this area throughout the year. As part of the treatment protocols, it will be assumed that the treatment areas within this plan provide nesting and/or foraging habitat for California clapper rail and, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented.

Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

- Perform work only from Sept. 1 through Jan. 31 to avoid California clapper rail breeding season (BIO-5.1; CM-18)
- For work within the California clapper rail breeding season, call counts will be performed in the early spring according to FWS protocols (CM-18)
- Provide California clapper rail field biologist supervision (BIO-5.1)
- Assure that field personnel are trained in general California clapper rail biology, identification, and call detection (BIO-5.1)
- Report any California clapper rail activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.1)

California black rail – This site contains suitable habitat for the California black rail (*Laterallus jamaicensis coturniculus*) within the area slated for non-native *Spartina* control work under this plan. The black rail utilizes the dense cover of brackish tidal marshes, and prefers mixed *Salicornia* vegetation. They nest in tall grasses and grass-like vegetation as well as mixed *Salicornia* stands well above ordinary high tides. They are especially abundant in areas where tidal creeks dissect the marsh plain, and adjacent vegetation is able to provide adequate cover during high tide events.

salmon, steelhead, delta smelt, Sacramento splittail, soft bird's beak, Suisun thistle, California sea-blite, and harbor seal.

Mitigations for *Spartina* control work within California black rail habitat will conform to those established for the California clapper rail and therefore, unless otherwise authorized by the FWS, control activities will not occur during nesting season (February 1 to August 31). Also, all Best Management Practices and mitigations identified in the PEIS/R will be implemented. Additionally, the following mitigations will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures:

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- Use shortest possible access route through any pickleweed habitat. Flag areas of repeated access (BIO-4.1; CM-15)
- Use protective mats or other covering over pickleweed in areas of repeated access (BIO-4.1; CM-15)
- Assume presence of salt marsh harvest mouse on all suitable sites (CM-14)
- Whenever possible, schedule work after mass mortality events caused by extreme high tides (CM-16)

Suisun shrew – This site contains suitable habitat for the Suisun shrew (*Sorex ornatus sinuosis*) within the area slated for non-native *Spartina* control under this plan. This shrew species uses wet, medium-high salt marshes where they are provided dense, low cover, an abundant invertebrate food source, and nesting sites, which may include native *Spartina* marsh. Suisun shrew prefer areas of mixed driftwood and *Salicornia* within the wet middle marsh, and may use dryer high marsh areas for refugia during extreme high tide events.

In addition to the following mitigations, which conform to those established for the endangered salt marsh harvest mouse, Best Management Practices, including minimizing access routes, will be utilized to assure the reduction of potential impacts to the Suisun shrew and its habitat:

- Use shortest possible access route through any pickleweed habitat. Flag areas of repeated access (BIO-4.1; CM-15)
- Use protective mats or other covering over pickleweed in areas of repeated access (BIO-4.1; CM-15)
- Assume presence of Suisun shrew on all suitable sites (CM-14)

- Whenever possible, schedule work after mass mortality events caused by extreme high tides (CM-16)

Song sparrow – The marsh slated for treatment under this plan contains sufficient suitable habitat to support Suisun and San Pablo song sparrows (*Melospiza melodia samuelis* and *M. m.maxillaris*). Song sparrows do not generally inhabit the bayward, *Spartina*-dominated portion of Bay marshes, or unchannelized, *Salicornia*-dominated upper marsh plains. Song sparrows typically inhabit the *Salicornia* zone above the native *Spartina* zone, especially in channels or sloughs where *Grindelia* stands provide song perches and nesting above spring tides. Where *Grindelia* stands are limited, song sparrows may utilize coyote-bush (*Baccharis pilularis*) or mixed *Salicornia*-*Spartina* stands. Song sparrows also forage at low tide in the muds of smaller side channels within the marsh.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of song sparrows during treatment activities as outlined below:

- Report any song sparrow activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh
- Watch for song sparrow presence in the work area during early season treatment work (pre-August), especially in the smaller, upper reaches of channels.

Salt marsh common yellowthroat – The proposed treatment area of this site contains suitable habitat for the salt marsh common yellowthroat (*Geothlypis trichas sinuosa*). The salt marsh common yellowthroat inhabits tidal salt and brackish marshes in winter, but breeds in freshwater to brackish marshes and riparian woodlands during spring to early summer. Territories of common yellowthroat often straddle the interface of riparian corridors or marshland and the upland vegetation of weedy fields or grassland.

Site treatment activities will follow the PEIS/R guidelines for minimization and avoidance of common yellowthroat during treatment activities as outlined below:

- Report any salt marsh common yellowthroat activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.3)
- Avoid spraying or removing *Grindelia* plants in the marsh

Western snowy plover – Suitable plover habitat exists within or adjacent to portions of this site. The Western snowy plover (*Charadrius alexandrinus nivosus*) uses beaches, tidal flats and salt pans for foraging, which may include shallow probing of the substrate or taking prey from the substrate surface. Snowy plovers roost on the salt pans of dry or partially dry salt evaporators, on barren to sparsely-vegetated interior salt pond levees, and on sandy tidal flats, and young may use adjacent vegetation for hiding and foraging. The natural analogues to these open, unvegetated habitats in San Francisco Bay were extensive sand and shell spits and natural salt ponds prior to modern development.

Plover presence will be assumed for all operations at this site, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. In addition to the following mitigations, Best Management Practices including minimizing access routes will be utilized to assure the reduction of potential impacts to the Western snowy plover and its habitat:

- Survey access levees for nesting Western snowy plover prior to entry (BIO-5.4; CM-20)
- Report any Western snowy plover activity immediately to ISP Field Supervisor and in post-treatment report (BIO-5.4)
- Ensure 500-foot buffer around nests for any helicopter activity (BIO-5.5)

Chinook salmon – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and juvenile Chinook salmon (*Oncorhynchus tshawytscha*) of all four runs (winter, spring, fall, and late fall) are indicated year-round in the shallows and off-shore of this site. Juvenile Chinook salmon forage in the intertidal and shallow subtidal areas of tidal marsh mudflats, sloughs, and channel habitats, as well as open bay habitats of eelgrass and shallow sand shoal areas. The distribution of juveniles changes tidally, with fry moving from tidal channels during flood tides to feed in nearshore marshes. Fry disperse along the edges of marshes at the highest points reached by the tide, then retreat into the tidal channels with the receding tide. Smolts congregate in surface waters of main and secondary sloughs and move into shallow subtidal areas to feed. Foraging and/or movement of Chinook salmon will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse affects on estuarine fish (BIO-6.4)

Steelhead – Suitable salmonid habitat exists within the vicinity of the areas slated for treatment under this plan, and winter run steelhead (*Oncorhynchus mykiss irideus*) are indicated offshore of this site. Steelhead are typically found within freshwater streams, rivers and sloughs that they use for spawning, and intertidal marsh areas of the Bay are unlikely to harbor large populations of this species. However, movement of steelhead offshore of this site will be assumed for all operations, and appropriate mitigations will be employed for all impacts identified in the PEIS/R. The following mitigations will be employed at this site:

- Minimize spraying near intertidal mudflats and channels (BIO-6.4)
- Avoid use of alkylphenol ethoxylate surfactants adjacent to channels to minimize any potential adverse affects on estuarine fish (BIO-6.4)

Sacramento splittail – The treatment area encompassed by this plan contains suitable habitat for the Sacramento splittail (*Pogonichthys macrolepidotus*). Sacramento splittail inhabit both fresh and brackish water, and are tolerant of a variety of water temperatures, dissolved oxygen levels, and strong water currents. Splittail can be numerous within small dead-end sloughs, those fed by freshwater streams and larger sloughs in the North and Suisun Bays. Juveniles and adults can be found along shallow edgewater areas lined with emergent aquatic vegetation, while adults prefer to spawn in shallow, seasonally inundated vegetation. Site treatment activities will follow the PEIS/R guidelines for minimization of spray drift during treatment activities as outlined below:

- Spray drift near channels shall be minimized and conform to ISP herbicide drift management plan or equivalent (BIO-6.2; CM-13)

Cultural Resources

The Petaluma site will be submitted to the US Department of the Interior, Fish & Wildlife Service Cultural Resources Team (CRT), Sherwood, Oregon in 2007, as appropriate, for Section 106 review. It is expected that CRT will apply “Appendix B” determination to the Petaluma site, after conducting field surveys on the site.

The appearance of cultural resource properties can never be predicted with certainty. There is the potential for subsurface deposits in this project location. Should any cultural deposits be encountered during any phase of the project, work shall halt and the CRT office will be notified. The Regional Archaeologist, or other similarly qualified individual, should make an assessment of the deposits before work may resume in the area of discovery.

Visual Resources

The ISP Site-Specific Control Plan for Petaluma River Complex Sub-Area 24d currently calls for continued monitoring of the marshlands within the sub-area, with no known non-native *Spartina* infestations requiring treatment. If any non-native *Spartina* is identified within the area during the 2007 treatment season, it will very likely consist of a few scattered clones in discrete locations within the area. As a result, the visual impact of the *Spartina* control at sub-area 24d will be minimal due to the small size of the treatment areas relative to the large intact native marsh matrix surrounding the site. In addition, the treatment will roughly coincide with the beginning of senescence of some salt marsh plant species as autumn approaches. Scattered patches of dead *Spartina* resulting from the herbicide application should not create a significant visual impact. Although ISP signage has been developed to educate the public about *Spartina* invasion and control in the San Francisco Estuary, permanent/long-term signs will probably not be utilized at sub-area 24d due to the lack of a central infestation, the scattered nature of the many treatment areas, and the low visibility of the site.

Adjacent Land Uses

The *Spartina* control methods to be implemented at this site are very targeted, greatly reducing or eliminating the possibility of producing a negative environmental impact on adjacent lands as a result of the *Spartina* control work. Applicators following the proper protocols to mitigate impacts to the treatment site will simultaneously be reducing/eliminating impacts to adjacent lands. However, since Sub-Area 5d provides recreational opportunities right up to the marsh edge (in the vicinity of the *Spartina* control work), it may be necessary to restrict access by closing the public trail system during the herbicide treatment. ISP will work with DENWR to determine the best way to temporarily close the treatment areas 24 hours before and after the herbicide application so as to mitigate impacts to human health and safety.

The following mitigations for potential adjacent land use impacts will be employed on site as per the PEIS/R and the FWS Programmatic Biological Opinion Conservation Measures (See Attachment 3: Environmental Compliance):

- Minimize drift according to ISP drift management plan (HS-3; CM-3, 4)
- Post appropriate signage a minimum of 24 hours pre-treatment (HS-3)
- Avoid scheduling herbicide application near high public use areas during weekends or holidays, or close public access to area 24 hours before and after treatment (HS-3)
- Maintain ISP or approved equivalent Site Safety and Spill Prevention plan on site (HS-4; CM-3, 4, 17)

Since aquatic areas such as the Bay allow for movement of water between sites, water quality issues in one area may translate into water quality issues at adjacent sites. Mitigations related to the actual application of aquatic herbicide formulations will be sufficient to avoid water quality impacts to adjacent areas because of herbicide breakdown or adsorption, as well as dilution from the large volume of the Bay. The other major water quality concern, related to spills, will be mitigated in the same manner for adjacent areas as on the treatment area itself. For both herbicide or petroleum spills, ISP has provided or approved a Spill and Containment Plan to mitigate the degradation of water quality from such an event.

The Site Specific Project Mitigation matrix developed for Petaluma River complex sub-area 24d identified three possible Water Quality related impacts and their applicable mitigations:

- Apply herbicide directly to plant at low tide and according to label (WQ-1; CM-3, 4)
- Apply under supervision of trained applicator (WQ-2; CM-3)
- Implement spill and containment plan provided or approved by ISP (WQ-2, 3; CM-17)

7. Environmental Assessment

This section considers the combined effects of implementing this Site-Specific *Spartina* Control Plan at all of the sub-areas over the single-year timeframe of this plan.

7.1 Affected Environment

The action area of this Site-Specific Plan includes large areas of marshland and brackish tidal riparian habitat as described generally in Section 3.1 and in more detail individually within Section 6. These marshes are entirely within or adjacent to San Pablo Bay within the San Francisco Bay Estuary. These marshlands are all located within Solano and Marin Counties, adjacent to the cities of Petaluma and Novato, and the town of Lakeville.

The Petaluma River area covered in this Site-Specific Plan comprises some 4,500 acres of historic tidal marsh habitat, developed shoreline, brackish tidal riparian edge zones, maintained pastureland, restoration sites, light industrial facilities and urban development. An estimated 0.2 total acres of non-native *Spartina* require removal in this area. This represents less than 0.01% of the overall marsh area of this site.

7.2 No Action Alternative

Under the No Action Alternative, the long-term detrimental impacts associated with the invasion of non-native *Spartina* throughout the Petaluma River complex, as described in the Purpose and Need for Project (Section 4), would continue. The lack of a coordinated treatment effort throughout the North Bay would facilitate the conversion of the various habitat types found throughout this site to raised, non-native, monocultural *Spartina* marsh. This in turn would change the physical, biological and chemical structure and function of the many marshes of the Petaluma River complex, dominating the marshes eventually contributing to similar changes throughout the north San Francisco Bay Estuary by providing a dense and thriving locus for propagule dispersal.

7.3 Proposed Action - Evaluation of Impacts

The proposed action for this 4,500-acre site is to treat the 0.2-acre area of non-native *Spartina* with land and boat applications of aquatic herbicide. Applying estimated treatment efficacy and *Spartina* expansion rates, this will comprise treating all 0.2 acres the first year, and any remaining or newly discovered stands in the following year. It is anticipated that in 2008, less very little non-native *Spartina* will remain in this area requiring control.

In compliance with the ISP's Final PEIS/R Mitigation, Monitoring, and Reporting Plan, each sub-area of this site was evaluated to determine potential site-specific impacts and necessary mitigation and conservation measures¹. This evaluation is attached as Site-Specific Project Impact Evaluation and Site-Specific Project Mitigation checklists (Attachment 3).

Additional, detailed assessments of potential impacts to species of concern, cultural resources, visual resources, and adjacent land uses were also completed for each sub-area. These are included in Section 6 of this document and summarized below.

Special Status Species

Some areas of the site have, or have potential for presence of, one or more of nine special status species, including salt marsh harvest mice, salt marsh wandering shrew, California clapper rail,

¹ The evaluation addressed 12 general categories including geomorphology and hydrology, water quality, biological resources, human health and safety, land use, and cultural resources, as well as other important environmental resources and values.

harbor seal, Western snowy plover, Alameda song sparrow, salt marsh common yellowthroat, winter or spring-run Chinook salmon, and steelhead. Potential impacts to these species were determined to be less than significant (i.e., the project is not likely to cause adverse affects) for all species after implementation of specified mitigations on the site.

Cultural Resources

The Petaluma River site will be submitted to the US Department of the Interior, Fish & Wildlife Service Cultural Resources Team (CRT), Sherwood, Oregon in 2007, as appropriate, for Section 106 review. It is expected that CRT will apply “Appendix B” determination to the Petaluma site, after conducting field surveys on the site.

Visual Resources

The potential impacts to visual resources were found to be insignificant at all of the Sub-Areas of the Petaluma River complex. A small fraction of the areas of marsh vegetation (a maximum of 0.1%) will be treated; it is unlikely that members of the public will be concerned about this amount of dead vegetation, especially since it will coincide with the natural autumn senescence of the marsh plants. In addition, temporary and permanent educational signage may be placed at the sites to inform the public and provide an opportunity for people to contact the ISP with questions. Individual Sub-Area mitigations are included in Section 6 of this document.

Adjacent Land Uses

The sub-areas in this plan will be treated via water and ground-based applications of herbicide. All adjacent trails will be closed to public access during and after this treatment. This will be a temporary impact to the trail users, and all usage will be restored subsequent to treatment. No other impacts to adjacent land uses are expected.

Conclusions

All treatment methods and approaches proposed for the site are consistent with those anticipated in the PEIS/R. All impacts caused by the treatment were identified for each Sub-Area in the Site-Specific Project Impact Evaluation and Site-Specific Project Mitigation checklists (Attachment 3), and in this document, and all appropriate mitigations have been identified. All unavoidable impacts were among the significant and unavoidable impacts previously identified and approved in adoption of the ISP’s PEIS/R (September 25, 2003).

8. Permitting and Environmental Compliance

8.1 Required Permits and Authorizations

A number of state, regional, and local authorizations are needed to complete the proposed control work. A summary of the required authorizations and copies of any permits may be found in Attachment 3. Any permit requirements have been incorporated into the Site-Specific Impact Mitigation Matrix also found in Attachment 3.

8.2 Mitigation and Conservation Measures

Pursuant to the ISP PEIS/R, the project has been evaluated to determine potential site-specific impacts and necessary mitigation and conservation measures. The evaluation addressed 12 general categories including geomorphology and hydrology, water quality, biological resources, human health and safety, land use, and cultural resources, as well as other important environmental resources and values. This evaluation is attached as Site-Specific Project Impact Evaluation and Site-Specific Project Mitigation checklists (Attachment 3). All mitigations identified in the Site-

Specific Project Mitigation checklist will be implemented and verified by the ISP Field Supervisor.

8.3 Restoration

The plan for controlling the non-native *Spartina* infestation on this site is targeted for selective control within the overall native marsh habitat. Adjacent stands of native pickleweed (*Salicornia* spp.), gumplant (*Grindelia* spp.) Pacific cordgrass (*Spartina foliosa*), as well as other native tidal marsh plant species (*Scirpus* spp., *Jaumea carnosa*, *Frankenia salina*, *Distichlis spicata*, *Limonium* spp., *Triglochin* spp., and others) will be avoided whenever possible. Subsequent to successful control, areas where non-native *Spartina* has been removed will offer patches of open marsh habitat for colonization by plant propagules present in the substrate and in the water column. The surrounding native tidal marsh plant population at this site as well as in this region of the Bay will serve to supply sufficient native propagules for natural vegetative recolonization of the site. It is not anticipated that revegetation or other direct restoration efforts beyond the removal of non-native *Spartina* will be necessary to allow native marsh conditions to begin to re-establish here.

Replanting of native *S. foliosa* plugs or other methods within this area is not advised. A characteristic of *S. alterniflora* hybrids is their ability to produce copious amounts of hybrid pollen as well as overlap the flowering period of the native *S. foliosa*. If *S. foliosa* is planted in proximity to stands of hybrid *Spartina*, there is a significant potential for ‘pollen swamping’ of the *S. foliosa*, resulting in hybrid seed production by the native. Therefore, until such time as the non-native *Spartina* hybrids are eradicated or significantly reduced in distribution on this site, no *S. foliosa* plantings will be undertaken.

8.4 Compliance Monitoring and Reporting

The Project will comply with all applicable regulations and permits and will submit reports according to the requirements of the agencies. Monitoring for compliance with the statewide National Pollutant Discharge Elimination System (NPDES) permit will be completed according to the Water Quality Monitoring Plan (WQMP) developed by the ISP. Portions of the WQMP applicable to this site are included in Attachment 3.

All data collected from this project will be reviewed by the ISP Monitoring and Data Assessment Team, and data and reports will be available on the ISP website (www.spartina.org), and upon request.

9. Research

The marshes within this site will be included in ISP yearly *Spartina* inventory and efficacy monitoring, in regional California clapper rail population surveys conducted by the ISP, the US Fish and Wildlife Service and others, and the yearly water quality monitoring requirements of State-wide National Pollution Discharge Elimination System (NPDES) permitting. These efforts provide updated site-specific information that will be used throughout the scope of this plan to adjust and refine treatment methods and approaches where appropriate.

10. Quality Assurance and Control

A Quality Assurance and Control (QA/QC) protocol is incorporated into each site-specific plan to ensure that impacts to the marsh and surrounding environment are mitigated, and that the control work proceeds as planned and achieves its goals. The QA/QC protocol requires each ISP grant recipient and implementing partner to incorporate the Site-Specific Impact Mitigation Checklist (Section 8.2, above) directly into its treatment work plans. To assure proper implementation of

the applicable mitigation and conservation measures, the ISP Field Operations Manager and staff will conduct frequent field visits during the *Spartina* control work.

By incorporating the Impact Mitigation Checklist into its work plan, the responsible ISP partner acknowledges the time, funding, and training of field staff that will be required to properly conduct the *Spartina* control work at its site. This advance preparation will help the partner to avoid and/or suitably mitigate potential impacts to the environment, and will provide a systematic checklist that field staff can follow as part of their project planning. Since the ISP partner must sign off on each mitigation and conservation measure as part of the development of their work plan and while implementing treatment activities, the ISP has the opportunity to assure that the mitigation requirements, and the reasoning behind them, are fully understood and that the partner is capable of implementing them on each site. ISP Field Operations staff will be on site or immediately available during each *Spartina* control event to provide technical assistance and oversight to the partner and contractors. The ISP Field Operations staff will intervene if an ISP partner or contractor fails to properly implement a mitigation and conservation measure, and will halt activities until the problem can be resolved.

Any failure to properly implement a mitigation or conservation measure will be reported to the ISP and to the Conservancy, who will initiate a consultation with the relevant regulatory agency (e.g., U.S. Fish and Wildlife Service or the Regional Water Quality Control Board) to determine an appropriate course of action. Actions in response to a failed mitigation or conservation measure may include implementation of additional mitigation measures by the implementing partner, and/or the issuance of a notice of violation to the implementing partner by one or more agencies. In addition, the Conservancy may choose to withhold payment of grant funding for work done in violation of a mitigation or conservation measure, whether or not the grantee was directly overseeing the work.